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TUBERCULOSIS in SCHOOL CHILDREN,

From a School Medical Officer's Point of View

being

A Thesis for the Degree of M.D.
of the University of Edinburgh,

By

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TUBERCULOSIS in SCHOOL CHILDREN.

Introductory.

Whatever may be said of the world in general, the medical profession has for long been alive to the prevalence in our midst of what it is now common to speak of as "the awful scourge of consumption." But it was the Housing Commission with its revelations of overcrowding and insanitary home conditions that first opened the eyes and stirred the social conscience of the man in the street, arousing in him the desire to join hands with medical science and enter the field against the formidable enemy. With the National Insurance Act has come the awakening of the man in the slums. It remains to be seen what may be the ultimate effect of this much discussed measure in bringing home to the poorest classes the need of aiming at improved home surroundings, and in securing their co-operation meanwhile, in taking advantage of the benefits even now within their reach - free ventilation, greater personal and domestic cleanliness, a more judicious selection of food stuffs with a view to obtaining the highest nutritive value, not to speak of free and immediate medical advice on the first symptoms of approaching illness.

Among the direct results of the information obtained by the Housing Commission, the clauses in the Education /

Education Act 1908 dealing with the Medical Inspection of School Children take a foremost place. It was recognised amongst other things that if the national scourge of Tuberculosis were to be effectively dealt with, good results could only be obtained by dealing with it in the earliest stages. "Begin with the children" became the cry alike of the Medical Profession and of the Educational Authorities, who recognised the comparative ease with which the children in the National Schools could be systematically supervised.

Supervision came first, and was at first all that was aimed at. But a very short period of practical work was necessary to convince all concerned that if medical examination and supervision were to be productive of any good results beyond the collection of elaborate statistics, medical treatment must inevitably follow. Medical Officers and Nurses did their best to impress upon Parents the benefit to be derived from seeking medical advice, either privately or at the Hospitals, but their counsels were as often as not neglected, or, where followed, the treatment recommended was most imperfectly carried out.

Accordingly it became apparent to the Authorities that something of a practical nature must be done, and as the result of representations in the proper quarter, the 1908 Act was last year amended so as to enable School /

Education
Act
1908.

Medical
Supervision
of
School
Children.

Amending
Act
1913.

School Boards throughout the country to carry out a measure of treatment. As far as Tuberculosis in children is concerned, this additional power should prove of the greatest value, since it enables the school medical officer not merely to advise, as formerly, but, where necessary, at once to follow up his diagnosis of the disease whether in bones, joints, glands, or alimentary system. Not only so, but the treatment of minor ailments, decayed teeth, anaemia, &c. all tend to raise the constitutional standard of the child, and render him less liable to tubercular infection.

Ever since I commenced the study of medicine I have felt myself particularly attracted by that branch of the science which deals with the Diseases of Infancy and Childhood. In particular, the Tubercular Diseases of children have always seemed to me to offer a wide and absorbing field of observation and study. The alarming frequency of the occurrence among children, of Tuberculosis in one form or another, has been brought home to me more forcibly than ever during the four years in which I have acted as Medical Officer to Leith School Board. In that capacity, I have the sole medical supervision of close on 14,000 children, between the ages of five and fourteen years. Of that number nearly 6,000 pass through my hands annually, and scarcely /

scarcely a day passes without my coming in contact with one or more children affected by Tuberculosis to a greater or less degree.

In selecting a subject for my Thesis, it therefore seemed to me that I could not do better than decide upon that which is so constantly before my mind, and as regards which I have the fullest opportunities for observation and a certain measure of treatment. In carrying out this idea I hope to discuss the subject of Tuberculosis mainly from the standpoint of the School Medical Officer, and consequently will lay more stress upon the varieties met with in this capacity, namely, Disease of the Glands, Bones, Joints and Lungs.

Scope of
Thesis.

Advanced stages of the disease in any form will not be entered into at length, children who are too ill to attend school, or to present themselves for examination at a school supervision centre, passing beyond my jurisdiction.

I hope also to give a detailed account of the method of procedure adopted in Leith, not only as regards diagnosis, but also in the matter of treatment, both prophylactic and curative.

INCIDENCE of the DISEASE.

Authorities vary as to the proportion of children affected by the various forms of Tuberculosis, - active, latent, or occult, but all statistics go to prove that in /

Incidence
of
Tuberculosis.

in one or other of these forms it is exceedingly prevalent. Some authorities, basing their deductions upon post-mortem examinations, maintain that it is almost universal. What is of paramount importance is that the frequency of early infection, the influence of age, and the spread of the disease by stages should be adequately appreciated.

At the commencement of life Tuberculosis is extremely fatal, the mortality almost keeping pace with infection. A most striking fact, however, is that as the child approaches school age, i.e. 5 years, and during school life to 14 years, the mortality is practically nil.

Mortality
and
Morbidity.

I am speaking, of course, of children in the national schools, and I am inclined to think that one reason may be looked for in the school environment itself, the hygiene of the school, though by no means perfect, being, on the whole, a great improvement on the hygiene of the majority of the childrens' homes.

Influence
of
School
Life.

There is also the daily regular walk to and from school, the frequent romp in the playground, and the systematic physical exercises which are now a part of every Board School Curriculum. All these are factors which make for an improvement in general health, and must tend to raise the disease resisting powers of the child condemned by circumstance to pass the greater part /

part of his life in an overcrowded slum. Moreover, the slum child of school age is himself in a manner of speaking a selected individual, since he has survived the test of those infantile diseases which reap such a terrible harvest in the homes of the very poor, and has even proved himself superior to that tubercular infection, which, as I have already said, proves so generally fatal during infant life.

During adolescence and early adult life, the disease is apt to develop with astonishing rapidity. Immediately the comparatively healthy routine of school life is past, and the adolescent is subjected to the more or less unhealthy conditions of the occupation he is compelled to follow, the longer hours, the closer atmosphere of workroom or workshop begin to tell, and the germs of disease that during school life have lain dormant, at once spring into activity.

The underlying cause is to be looked for in the fact that the lymph glands form the main defence against the tubercle bacillus. During infancy these glands do not appear to have developed their protective power, or, at any rate, only in a very slight degree, the result being that a spread of the bacillus to vital organs is readily permitted. The glands develop during early childhood, and mechanically arrest the micro-organisms/

Adolescence.

Protective
influence
of
glands.

organisms. Later on again the affected glands may become active from some specially determining cause, and form clinically the primary focus from which the disease spreads to other structures.

The subject is one of extreme perplexity, and the manifestations are so many and varied that it is quite impossible accurately to gauge the percentage of children affected. There can be little doubt that many of the children classified as "delicate" - the children who are constantly suffering from some minor ailment, who annually contract an attack of bronchitis, who are the first to become affected at the onset of an epidemic, and the most likely to fall victims to the sequelae of infectious disease - owe their susceptibility to the fact that they are harbouring the tubercle bacillus, even although it may not be possible to recognise it.

It is difficult to form an accurate percentage of deaths due to tuberculosis in children, but the death rate is greatest during the first five years of life.

Percentage
of
Deaths.

In proof of this statement the following statistics are of interest:-

England /

England and Wales :-

<u>Year.</u>	<u>Cause of death.</u>	<u>Deaths under</u>	<u>Death rate per</u>		
		<u>one year of</u>	<u>1000 living.</u>		
		<u>age per 1000</u>			
		<u>births.</u>	1 to 5:	5-10 :	10-15.
1910.	<u>All Causes.</u>	105.44	14.79	3.05	1.91
	<u>Phthisis.</u>	0.39	0.27	0.13	0.27
	<u>Other Forms</u> <u>of</u> <u>Tuberculosis.</u>	3.52	1.49	0.47	0.30
1911.	<u>All Causes.</u>	130.06	14.68	3.42	2.05
	<u>Phthisis.</u>	0.35	0.26	0.16	0.29
	<u>Other Forms</u> <u>of</u> <u>Tuberculosis.</u>	3.46	1.53	0.48	0.29

In /

In England and Wales the percentage of tuberculosis is said to have been discovered by School Medical Officers during the routine examination of children in schools was .59 in 1911, and .56 in 1912. In London, for the latter year, the percentage of phthisis was .31, and that of other forms of tuberculosis, .24.

England
and
Wales.

London.

There is good reason to suppose, however, that these returns cannot possibly represent the total amount of tuberculosis existing amongst school children. To anyone acquainted with the conditions of school medical examination, the understatement may easily be accounted for. There are always a number of children liable to be absent from school on the day on which they have been summoned for the routine examination, and if, as may very well happen, they are suffering from tuberculosis, the case escapes the notice of the Medical Officer, who would never get through the work expected of him if he had to go back afterwards on every case not seen at the appointed time. Of the absentees, a certain number are no doubt under the care of their own medical practitioner, who perhaps grants a certificate that they are suffering from "Debility", and with that the school authorities have to be content, though it is of little value for purposes of accurate classification.

Percentage
probably
under-
estimated.

Conditions
of
School
Medical
Examination.

But there is always a certain proportion that are /

are missed altogether, even by the most conscientious Medical Officer. Nor is this to be wondered at. In most schools no room is specially set apart for medical examination, and the work has to be carried on in whatever room can best be temporarily spared for the purpose, with the noise from adjacent classrooms and from outside traffic making an accurate diagnosis by means of the stethoscope impossible.

Considering the universal interest now being manifested in the physical welfare of the community, and more especially in the eradication of tuberculosis, I have no doubt that these drawbacks will presently disappear. A quiet room in every school should be reserved for the purposes of medical inspection, and all the medical men in a district should be invited to co-operate with the School Medical Officer, at least to the extent of notifying him of any case of known or suspected tubercle in school children occurring in their practice. This would at least be of use in compiling full and correct statistics, and, where no objection was made, the children could then be kept under supervision at the Inspection Clinic, i.e. the Clinic which every School Medical Officer conducts at his own office. It is at this Clinic that by far the greater percentage of tubercular cases are detected, the conditions of examination being more favourable than in the schools, and /

Special
Accommodation
greatly
required.

School Clinic.

and the children in attendance being those who have been discovered in school to be of a weakly constitution, or who are suffering from some disease or minor ailment.

As evidence of the amount of tuberculosis discovered by School Medical Officers in Scotland, I give a few results obtained from their reports for the year ended July, 1912. Statistics for the year ended July, 1913, are not yet to hand.

Incidence
of
Tuberculosis
in
Scotland.

In Aberdeen, 0.3% of children undergoing routine examination at school suffered from tuberculosis of the bones or joints, and pulmonary tuberculosis was found in about .1%.

Percentage in
Aberdeen.

The School Medical Officer of Edinburgh does not give percentages, but states that :- "Phthisis or "pulmonary tuberculosis was detected in 8 cases. About "25 children had signs or symptoms suggestive of pulmonary tuberculosis, and were put under supervision. "It should be stated that 166 cases were reported from "the Victoria Dispensary for Consumption as being unfit for school for more or less lengthy periods. "Fifty-two cases of phthisis were also seen among the "'Special cases' at schools, the majority of these "being under medical treatment at home or at Dispensaries and Hospitals. As evidence of tuberculosis in "other forms, the following figures are repeated - 15 "cases /

Edinburgh.

"cases of hip joint disease; one tubercular dactylitis; 4 spinal disease; 170 pupils with marked enlargement of glands, probably tubercular in many cases; 201 pupils with scars due to abscesses or gland operations."

In Glasgow during the examination of 1,254 children specially presented on account of some declared ailment, the School Medical Officer found 4 cases of bone or joint tuberculosis; 7 of general tuberculosis; 5 of glandular tuberculosis; 1 of peritonitis; 7 of skin tuberculosis; 2 of tabes mesenterica - a total of 26, equivalent to about 2 per cent.

Glasgow.

In only 25 out of 14,869 children examined was pulmonary tuberculosis discovered, or 0.2%.

In Leith during the year ended July, 1913, of 2,295 children undergoing the routine examination at the schools the number suffering from pulmonary tuberculosis was ^{7 or} 1.3%. It must be borne in mind that this estimate is arrived at from the ordinary clinical methods of diagnosis at a first examination, without the use of tuberculin.

Leith.

There were also 4 cases of hip joint disease, 2 of spinal disease, 1 of tubercular dactylitis, making with the 7 cases of pulmonary tuberculosis already cited a total of .61%. 37.1% of these children showed slight enlargement of the cervical glands, and 15% marked /

marked enlargement - probably tubercular.

Suspected cases were kept under supervision and repeatedly examined at my office. Many proved to be tubercular, and are included in the returns of non-routine or "special" cases.

Altogether 2,885 non-routine or special examinations were conducted at the office, and 259 children, or 8.7% were found to be suffering from tuberculosis in one or other form :-

<u>Pulmonary Tuberculosis</u>	197
<u>Tuberculous Glands</u>	26
<u>Hip Joint Disease</u>	4
<u>Spinal Disease</u>	6
<u>Bones and Joints (not Spinal Disease.)</u>	26
	<hr/>
	259
	=====

With the object of ascertaining the incidence of tubercular disease in the living, Hamburger of Vienna made a series of post-mortem examinations on children in whom the immediate cause of death was not tuberculosis but some other disease.

He gives the following statistics, showing the percentage incidence of tuberculosis at various ages.

At /

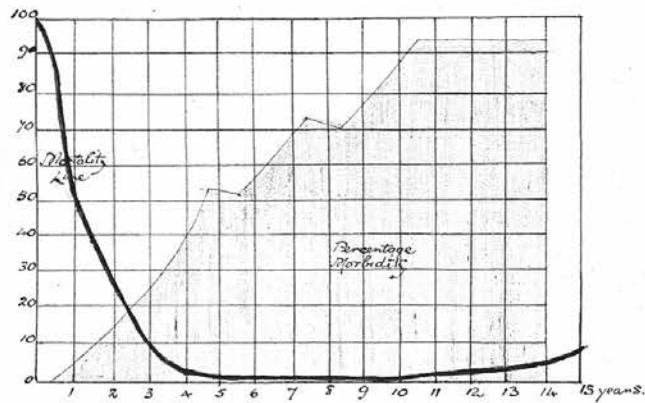
Percentage in
Special Cases.

Results obtain-
ed by Hamburger

At 0-6 months	.0% tubercular.
" 7-12 "	4.5% "
" 1-2 years	17.0% "
" 3-4 "	30.0% "
" 5-6 "	34.0% "
" 7-10 "	35.0% "
" 11-14 "	53.0% "

If we accept the modern theory that every child who reacts to the tuberculin test is tuberculous, the figures are much more appalling. In illustration of this, it may be well here to insert the table prepared by Hamburger and Monti after the use of cutaneous, reinforced by subcutaneous local test among 509 school children in Vienna.

Table /



(after Escherich. Wien. med. Wochenschr., 1911 lxi. 115) Shows the percentage morbidity after Hamburger and Monti, and also the percentage mortality on these figures calculated from the tuberculosis mortality tables of Vienna for the same year (1909).

These results would seem to show that at any rate in Vienna, tuberculosis is practically universal amongst school children.

The results obtained by Sir Robert Philip, who made an exhaustive examination of a series of school children in Edinburgh are not quite so startling, 30% only being found to be affected. This proportion is still high enough, however, to justify the conclusion that Tuberculosis is the most serious of all the diseases of children.

Tuberculosis
the most se-
rious of all
children's
diseases.

It is to be borne in mind that these figures apply only to children of the poorer class, and it is to this type of child that I also refer, my experience having been almost entirely confined to the children attending our Board Schools.

Amongst children of the better class, the incidence is not nearly so high, clearly showing that hygienic surroundings, good feeding, attention to cleanliness, especially of the head and teeth, and care of minor ailments, prevent a child's constitution from being lowered, and in consequence he is less liable to the infection of tubercle.

Classification. /

CLASSIFICATION.

The various forms of Tuberculosis in Children may be conveniently classified as follows :-

Forms of Tuberculosis.

Glandular Tuberculosis.
(Occult in Infancy.)

Surface, or Surgical Tuberculosis.
(Joints, Bones, Skin.)

General Miliary Tuberculosis.

Deep, or Medical Tuberculosis.
(Pleurisy, Phthisis, Peritonitis.)

PORTALS of ENTRY and MODES of DISSEMINATION.

The infection may be :-

1. Aerogenous. Infection by inhalation is commonly said to be by far the most frequent of all forms, both in children and adults. Lubaroch found in 1,820 autopsies, tuberculosis of the lungs, and tubercular nodules in 80 to 96% of his cases. This, however, does not necessarily prove that the infection was aerogenous, if examinations made on animals may be taken as affording any parallel in human beings. The result of numerous experiments in feeding healthy animals on tuberculous material was certainly to produce tuberculosis, but tuberculosis of the lungs, and not, as might have been expected, of the alimentary canal. On the /

Aerogenous Infection.

the other hand, bacilli may be inhaled and give rise to intestinal tuberculosis without affecting the lungs.

II. Enterogenous or Alimentary. This form of infection is by no means so common as aerogenous infection but is of special interest as regards children owing to the animated discussion as to whether or not tuberculous cow's milk really does give rise to such a vast amount of human tuberculosis as is frequently affirmed. Alimentary infection may occur not only from the ingestion of food, but also by inhalation of bacilli as above stated.

Enterogenous
Infection.

III. Haematogenous or Lymphogenous. This type is never found primarily, but is the result of the breaking down of foci elsewhere, and the spread of infection through the blood and lymph channels.

Haematogenous
Infection.

There is abundant evidence to show that oral sepsis from neglect of decayed teeth tends to cause enlargement of the cervical glands, and these are very prone to become the seat of tubercular infection.

Similarly, in the posterior triangle of the neck, the glands become enlarged through septic infection from a neglected head, and may become tubercular. The mucous membrane of the nose and throat, if not attended to, may also readily harbour the bacillus.

IV. Dermogenous. Hardly ever met with in children, but seen occasionally amongst butchers who have to handle tuberculous meat.

Dermogenous
Infection.

— DIAGNOSIS. —

The question of diagnosis is one of supreme importance. Under the heading "Incidence of Tuberculosis in Scotland" p.11, I have already quoted a number of statistics bearing on the incidence of tuberculous disease in childhood. From the variations in these, not only in different countries, but in different districts and towns in the same country, it seems clear that authorities, in drawing their conclusions, do not all take into account the same data. Thus one man unhesitatingly attributes to Tuberculosis, conditions which another more vaguely puts down to debility or to the presence of tubercle in some latent or occult form.

Advanced tuberculosis, in whatever form, is usually easily recognised, tubercular glands by bacteriological examination, disease of bones or joints by its typical signs and symptoms, phthisis by its clinical picture and the presence of the tubercle bacillus in the sputum.

In all doubtful cases which have come under my notice, the bacteriological examination of the sputum has invariably been carried out where possible by the Ziehl-Nielsen and the Antiformin methods. It is, however, always a matter of difficulty to obtain sputum from young children, though Holt has shown that the required specimen may frequently be secured by irritating the pharynx and obtaining on gauze any material coughed /

Advanced
Tuberculosis.

Examination
of
Sputum.

coughed up.

In the many instances in which one can only make a provisional diagnosis, it is necessary to have recourse to one or other of the special methods in order to determine whether or not the case is tubercular in character. I do not propose to enter here into the details of the numerous more or less scientific tests which, since Koch's discovery of tuberculin in 1889, have been introduced by various observers, each claiming for his own a certain degree of superiority. Suffice it to say they are all more or less modifications of Koch's discovery, differing from it either in the method of preparation or of administration. The greater number are either too complex or too expensive to be applicable in the case of school children, and some, e.g. Calmette's Ophthalmic Reaction are too risky to be attempted.

Koch's
Tuberculin.

The method adopted in Leith is that advocated by von Pirquet.

Von Pirquet's
modification.

CUTANEOUS TUBERCULIN REACTION.

Von Pirquet (Wien. med. Woch., 6th July 1907) discovered that when tuberculin is introduced into the superficial layers of the skin of tuberculous individuals, as in vaccination, a reaction occurs consisting of the formation of a papule with redness, slight swelling and exudation, and sometimes small vesicles. The /

The procedure in introducing the serum is as follows :-

The anterior and radial aspect of the forearm is thoroughly cleansed with ether, and thereafter a small instrument called a borer is used to make two scarifications of the skin on the prepared area. A drop of a solution of old tuberculin is then gently rubbed in to one scarification, the other being left as a control. The reaction is usually at its height twenty-four to forty-eight hours after inoculation. In absolutely healthy individuals there is no reaction.

Von Pirquet's
method
described

Von Pirquet gives his explanation of the principle of these reactions on the theory that all tuberculous persons develop a hypersensitiveness of the tissue cells to the poison of the tubercle bacillus, that is, there is an acquired immunity to the tubercle poison against which the system attempts to protect itself. This is attained by the formation in the blood of an antibody or "antigone" as von Pirquet terms it. In latent and occult cases the test may have to be repeated before a positive reaction is obtained.

But for the purposes of exact diagnosis the tuberculin test, as at present applied, can at best only be regarded as a pis-aller. What is required by the Practitioner and the School Medical Officer is a method of diagnosing active tuberculosis, and the tuberculin /

tuberculin tests at present in use appear to react positively even when the tubercle bacillus is merely latent.

Experiments with the object of more definite results are being carried on in every laboratory in Europe, and a writer in the British Medical Journal of 7th March, 1914, gives it as his opinion that the recent work of Besredka and his collaborators at the Pasteur Institute in Paris promises a large measure of success. The serum they have prepared is being used by many authorities on the subject, and they express themselves as highly gratified with the results, both as regards diagnosis and prognosis. The reaction is said to be very sensitive, and is in direct ratio to the stage of the disease.

In healing lesions the reaction is negative, the bacilli becoming surrounded by a fibrous or calcareous deposit in consequence of which they are unable to pour forth their toxins into the circulation. A negative result is also obtained where the disease is becoming rapidly fatal, because the response of the body by producing antibodies is failing. In these instances, however, the symptoms will be so evident that an injection to verify the diagnosis will hardly be necessary.

In the remaining cases, where the disease is active, yet not sufficiently marked to make a correct diagnosis /

Besredka's
Experiments.

diagnosis by the ordinary means possible, Besredka's method has also proved highly satisfactory. There is, therefore, every reason to anticipate with the keenest interest, the publication of further results. Why should we not hope one day to discover a serum with which all infants might be inoculated against tuberculosis shortly after birth as is the method at present practised against smallpox?

Predisposition.

The question of predisposition to tuberculosis has been the subject of much discussion. The view favouring hereditary influence has been strongly supported by some, and just as strongly denied by others, but the majority of investigators are in favour of the theory that practically all cases are due to post-natal infection. Still even if this be true, the "character of the soil" must also be taken into account. Professor Arthur Thomson in his book on "Heredity" states that in addition to the transmission of a constitutional vulnerability, the likelihood of a household infection, and the persistence of conditions of life which may favour the disease, there are probably two other factors. On the one hand, a seriously tubercular mother may be unable to adequately nourish her offspring before and after birth, and the ill-nourished offspring becomes more readily the prey of tubercular disease. On the other hand, the bodily /

Heredity.

Post-natal Infection.

bodily disturbances induced by tubercular disease in the parents may prejudicially affect the vigour of the germ cells themselves and lead to the production of an inferior offspring.

As evidence in favour of this view, instances are on record where the elder members of a family have gone to reside abroad before their successors were born, and yet all eventually died of tuberculosis.

One thing that cannot be gainsaid is that tuberculosis is extremely common in infancy, and more common in children of tuberculous parents than in those of parents free from such a taint. As a practical measure, therefore, the children of tuberculous parents should always be looked upon as predisposed subjects, and as in most cases actual infection occurs in infancy, at the period when a child is least able to resist bacterial invasion, surely the remedy, or at any rate the method of procedure with regard to diagnosis and treatment must be to deal not merely with the child, but in the first instance with the infant.

Offspring of
Tuberculous
parents
peculiarly
liable.

The diagnosis of active tuberculosis, and especially the pulmonary variety, in children, from the point of view of the School Medical Officer, is in many instances a difficult matter. It is nearly always impossible to be certain of a positive diagnosis after only one examination, and during routine work at the schools there are two classes of children to be dealt with, in one of which at least a second examination is not always permitted. To this class belongs the non-necessitous child, i.e. the child whose parents are in a position to seek private medical advice. In such cases, if one suspects the presence of tuberculosis, the parents are notified and advised to consult their own doctor. If this advice is followed, the care of the case is immediately transferred from the School Medical Officer to the family medical man.

Secondly, there is the necessitous child, or the child whose parents cannot afford to pay for private medical advice. If a suspected case is met with in this class, the parents are requested to bring the child to my office on a certain date for a more minute examination, and much valuable information is frequently obtained from them, especially as regards family history.

As previously stated, this is a matter of paramount importance. In about 50% of my own cases of pulmonary tuberculosis I was able to obtain a definite family history of consumption, and in roughly another

Diagnosis
from
Standpoint
of
School
Medical
Officer.

The non-
necessitous
child.

The
necessitous
child.

Importance
of
family
history.

10% a dubious history was forthcoming. But even taking into account the supposition that many of these children may have had a predisposition towards tuberculosis, still the high percentage infallibly points to the conclusion that tuberculosis in children is contracted far more frequently by actual contact with tuberculous persons than in any other way. During infancy a child spends far more time in the house than at a later period, and if the household happens to include a member suffering from tubercle, the infant runs the very greatest risk of infection, either through direct contact with the infected person, or by means of articles that have become contaminated.

To proceed now with the consideration of the diagnosis of the different varieties of tuberculosis which more especially come within the province of the School Medical Officer, viz :- Tuberculosis of Glands, Bones or Joints, and Lungs.

Varieties of Tuberculosis.

1. TUBERCULOSIS of GLANDS.

One of the most striking features of tuberculosis amongst children is its tendency towards rapid generalization, and on this account the prognosis is much more serious than in adults. As elsewhere stated the rapidity of spread is to be attributed to the fact that the resisting power of the glands is largely undeveloped and the tubercle bacillus having once effected a footing, increases and multiplies at a remarkable /

Glands.

remarkable rate. If neglected, the infection is transmitted from gland to gland, and one softening or caseous gland often proves the focus of a general infection in later life.

Glandular disease, so long as it is limited to the glands, is, on the whole, the least dangerous to life; but it is often insidious in onset, and is a source of danger because, especially amongst the poorer classes, it passes unnoticed until the mischief has become well-established. It cannot be too often repeated that ignorance and neglect are perhaps as important factors in the spread of tuberculosis as the tubercle bacillus itself.

Speaking generally, it is impossible to determine the mode of entry of the bacillus. It may reach the gland from the alimentary canal directly by way of the lymph stream. Or an inflammation may be set up due to the presence of some pyogenic organism which has found its way to the gland from an injured surface by way of the lymphatics. The resisting power of the gland is consequently lowered and it becomes a more favourable nidus for the development of tubercle.

(a) Cervical Glands :- The diagnosis of a tuberculous cervical gland is not usually a matter of serious difficulty. The chief point is to differentiate between it and a swollen gland of simple origin due to pyogenic mischief. In the latter case, the process /

(a)
Cervical
Glands.

process of development is usually acute, and the source of infection is easily recognizable. Enlarged tonsils and adenoids tend to give rise to hypertrophy of the glands at the angle of the jaw and the anterior border of the sterno-mastoid muscle immediately below it; decayed teeth and septic conditions of the mouth to hypertrophy of the submaxillary glands; neglected or eczematous conditions of the head to hypertrophy of the glands in the posterior triangles. Enlarged glands of this nature either speedily suppurate or immediately subside on the disappearance of the aggravating cause. On the other hand, the presence of a gland in which enlargement has been very gradual, where nothing is perceptible to account for its appearance, and no improvement occurs for some weeks, is strong presumptive evidence that the gland is tubercular, especially if occurring in children predisposed to tubercle. In Hodgkin's Disease, usually no focus of infection is evident, and a general widespread infection of the glands in different parts of the body rapidly sets in. Irregular or periodic rises of temperature occur, visceral enlargements soon become manifest, and also the glands rarely break down. In addition the glands remain free and do not become fixed as in tuberculosis. Lymphosarcoma is usually localized, but rapidly increases to a size large enough /

Symptoms.

Hodgkin's Disease.

Lympho-sarcoma.

enough to exclude the possibility of tuberculosis. These latter diseases are rare, and are only perplexing if met with in the early stages.

(b) Intra-Thoracic Glands :- Tuberculosis of the mediastinal glands, or Bronchial Phthisis as it has been termed by some writers, is the name given to a cheesy enlargement with softening or calcareous change in the glands of the Thorax, associated with any similar change that may be present in the lungs.

(b)
Intra-thoracic
Glands.

The symptoms of tuberculosis of the intrathoracic glands are somewhat indefinite, but a progressive condition of ill-health without any apparent cause should excite suspicion, especially if the child has been previously healthy. A troublesome dry cough, worse at night, paroxysmal in character, and resembling whooping-cough, is often met with. Signs of pressure may also be detected, such as difficulty in swallowing, or oedema of the neck and face. If the veins in the upper intercostal spaces, especially on the right side, are enlarged this is very significant. Dulness in the interscapular region frequently occurs, and bronchial breathing and even bronchophony may be present. The symptom of spasm is very intense and is sometimes mistaken for bronchitic asthma. The commonest mistake, however, is to suppose the child to be suffering from whooping-cough, particularly if an epidemic of that disease is prevalent at the time.

Symptoms.

It /

It is difficult to determine whether Bronchial Phthisis is primary or secondary. It is generally admitted that the mediastinal glands are very susceptible to the tubercle bacillus, that they early become involved, and sometimes there is abundant evidence that the glandular condition is the primary one, the pulmonary infection being a subsequent development. In other cases again the glandular enlargement is the direct result of pulmonary tuberculosis.

Primary
and
Secondary
Infection.

The mode of infection, though a vexed question at the present moment, is none the less very important, especially in relation to prophylactic treatment. Some observers regard the presence of old lesions in the mediastinal glands as direct evidence of aerogenous infection, the bacillus having reached its destination from the air-passages through the lymph streams. This theory cannot, however, be sustained, the experiments already referred to showing that in animals fed on a diet containing tubercle bacilli the earliest lesions appeared in the thorax. In other words, the alimentary canal may prove a direct path to infection of the mediastinal glands without being itself injured in any way.

Mode
of
Infection.

It is quite possible that infection of these glands may be caused by direct extension downwards of /

of tubercular disease in the neck. Experiments on pigs have proved that this may take place, but in human beings it is not considered of common occurrence. Were it so, then removal of tuberculous cervical glands would always be a matter of urgency.

The results of deposits in these glands may be :-

1. Extension into the lung.
2. Ulceration into a blood vessel causing acute general miliary tuberculosis.
3. Extension to the pleura, pericardium or mediastinum..
4. The gland may break down and perforate the trachea, main bronchus or oesophagus.

Results
of
Deposits
of
Tubercle.

I have no statistics of my own differentiating between Bronchial Phthisis and Phthisis in general. In a certain proportion of the cases met with, there is strong presumptive evidence of serious glandular mischief, but in the nature of my work, I have neither the time nor ^{the} means at my disposal to enable me to make a positive diagnosis.

Bronchial
Phthisis.

Rilliet and Barthez state that it occurs in 79% of all cases of pulmonary tuberculosis in children, and Goodhart and Still report that in 254 tuberculous children examined at the Childrens' Hospital, Great Ormond Street, the condition of the glands was specially noted and there was caseation of the mediastinal glands in 209 i.e. 82%.

(c) /

(c) Mesenteric Glands :- Caseous or tuberculous disease of the mesenteric glands, commonly called *Tabes Mesenterica*, is rarely recognised clinically, though it is a common condition in the post-mortem room. The statistics of the Childrens' Hospital, Great Ormond Street, show a total of 59% in 254 post-mortems on tuberculous children.

(c)
Mesenteric
Glands.

I should say that not more than .2% of tuberculous children seen by me last year could be said to show marked symptoms of this form of the disease, and the number would be yet further reduced if we consider that the abdominal swelling, wasted appearance, gastric pains, and other symptoms noticeable in these cases might with equal justice be attributed to under-feeding or to indigestion arising from a persistently unsuitable diet. When enlargement of the glands could be detected by palpation, and there was a history of night temperature, the presumption was held to be in favour of a tuberculous infection, and the case was treated accordingly.

2. TUBERCULOSIS of BONES and JOINTS.

Tuberculosis of bone is usually confined to the ends of the long bones, the cancellous tissue being more prone to attack than the compact tissue of the shaft, in which and in the bones of the skull tubercle is rarely met with.

Tuberculosis
of
Bone.

As /

As regards the joints, the synovial membrane or the bone underlying the articular cartilage is commonly the seat of infection.

Tuberculosis
of
Joints.

The symptoms are localised swelling, pain on pressure, wasting of adjacent muscles, loss of movement, and a tendency to flexion of the joint. Usually there is a history of previous injury, the injured tissue resulting from a fall or bruise, to which children are always so liable, affording a favourable situation for the rapid development of the bacillus.

Symptoms.

This variety of tubercular disease is pregnant with grave issues in the life history of the child. On account of its chronic character, the patient may have to undergo months of treatment, and permanent injury to a greater or less degree is almost always the result.

Frequency
of
permanent
injury.

From the educational standpoint the effect is also very serious, the long absence from school resulting in a loss of instruction that can never readily be made up, particularly among children whose school career ends at the age of fourteen. True, the crippled child is frequently remarkably intelligent and even precocious, and though this may to some extent be regarded as a compensation, it is all the more to be regretted that his opportunities should be curtailed. Special open-air schools for physically defective children are urgently required, and though several /

Loss of
Education.

Need of open-
air Schools.

several are now established throughout the country - Edinburgh possesses two - the number is not anything like equal to the proportion of children to whom admission would be a benefit and who at present are totally unprovided for.

In respect of tuberculosis of bones and joints, it is to be noted that under treatment many cases become suddenly arrested, and the patient completely recovers, though the resultant injury to the bone or joint remains permanent.

There is, of course, always the fear that such a latent focus may take on activity at a later date. Thus the usual accompanying deformity of the chest in disease of the upper vertebrae prevents the lungs from normal full expansion, consequently there is always the possibility that pulmonary tuberculosis may ensue.

In the children at present under my supervision on account of tuberculous disease of the bones or joints, (except the spine) I can detect no signs of lung mischief. Of the spinal cases, two have indefinite signs, and one is fairly far advanced with pulmonary tuberculosis.

Another interesting fact worthy of mention is that of the total number of cases, namely 36, suffering from disease of the bones or joints, all but two have only one lesion. The remaining two appear to be suffering from a generalized bone affection, one child having /

Recovery
under
Treatment.

A latent focus
may become
active.

Cases at
present under
supervision.

having undergone no less than 19 operations in different parts of the body, and the other 11.

3. PULMONARY TUBERCULOSIS.

I have already given statistics regarding the amount of definite pulmonary tuberculosis met with by a number of School Medical Officers, and have also given it as my opinion that if we had more reliable means of diagnosis at our disposal the number of children found to be affected would be greatly augmented. The School Medical Officer cannot possibly submit every child to a tuberculin test even should he so wish, nor is he in a position to take advantage of the Xrays to assist him. He must rely upon physical signs and symptoms, and these are not always a good guide in children. They may, in fact, prove very misleading.

Limitation
of
Tests.

What we endeavour to discover is not whether the case is one of miliary tuberculosis, fibroid phthisis, or a chronic form, but whether the child has active tuberculosis of the lungs in any form.

Scope
of
Diagnosis.

After the age of 5 years, i.e. at the commencement of school life, the signs and symptoms closely resemble those found in adults. At a first inspection the appearance of the child may arouse suspicion; one is impressed with the idea that here is a case requiring most thorough and careful examination. He may not present all the appearances of either of the types with which medical handbooks teach us to make ourselves /

Types
of
Children.

ourselves familiar, namely "the pretty child with well-formed skeleton, soft hair, long eyelashes, peach-like skin and intelligent mien", or his antitype, characterised by "coarseness; pale, sallow, stunted and thick skinned", yet one or more of these characteristics may be sufficiently in evidence to put the examiner on the alert.

The family history is of supreme importance. Parents are invited to attend the examination of their children at the schools, and their presence, in such cases, is frequently of great value. Should they not attend, the child brings back to the school a card which has been sent to the home from the medical department. This card, in addition to asking for information regarding the previous illnesses of the child, also invites the parents to state whether any relative has suffered, or is suffering, from tuberculosis, and it is not uncommon to learn that there is an actual case in the house.

Family History.

The history of the child himself is also taken into account. Progressive loss of weight and continuous ill-health which cannot be otherwise accounted for, night sweats, dry cough of some duration, and probably expectoration, or even haemoptysis is generally the history obtained of a child who after successive examinations proves to be tuberculous.

Personal History.

The /

The shape of the chest is not very distinctive, and in making a diagnosis too much reliance must not be placed upon this feature. Suffice it to say that deformed chests of any variety and arising from any cause are more liable to enclose tuberculosis than if the chest is healthy and well-formed. The prominence of the superficial veins, especially in the right upper intercostal spaces, is often noticeable, together with undue depression above the clavicles. On percussion, dulness may be detected, and auscultation frequently reveals impaired breath sounds, usually of the cog-wheel variety with prolongation of expiration, and moist crepitations may also be evident. The co-existence of several of these indications is to be relied upon rather than the presence of one of them.

Physical
Signs.

In considering the differential diagnosis, I need not take into account here such diseases as Pleurisy with effusion, Empyema, Bronchiectasis, &c., as it goes without saying such cases are not met with in school. Where there is distinct evidence of lung mischief, it comes to be that practically what one has to decide is whether it arises from Bronchitis or from Phthisis.

Differential
Diagnosis.

In Bronchitis, the signs are not localised in one lung or part of a lung, dulness is absent, and the râles are not so crepitant as in tuberculosis.

In /

In coming to a conclusion great caution must be exercised in every instance, since it frequently happens that signs strongly suggestive of tubercle, especially at the apices, clear up. The most difficult cases are those where the child has recently had measles or whooping-cough, because mucous râles and tubular breathing are often present and are apt to be very misleading.

As elsewhere stated, examinations in school, speaking generally, have to be conducted under circumstances which are anything but favourable to correct diagnosis. All suspicious cases, therefore, are requested to present themselves at my office at a fixed date. Here a most careful examination is made, and if the case is one not calling for urgent treatment, the child is examined every week for two or three weeks in order to watch his progress, and to determine as definitely as may be whether tuberculosis is present before taking further steps. During this period the school nurses visit the home and see that my instructions as to diet and the administration of tonics, &c. are being carried out. A suspicious patch of consolidation may, in the meantime, resolve, and the difficult cases met with after whooping-cough have time to clear up sufficiently to enable one to make /

Supervision
of
Suspicious
Cases.

Nurses' visits
to homes.

make a more certain diagnosis.

If, after repeated examinations, I am of the opinion that pulmonary tuberculosis is present, the child is sent on to the Leith Tuberculosis Dispensary, and enters upon a course of tuberculin treatment, the details of which I shall describe immediately. The patient still remains under my supervision, however, and must present himself periodically at my office, in order that I may be able to watch the progress of the case, and satisfy myself that his attendance at the Dispensary is regular, and that all instructions given are conscientiously carried out.

Tuberculin
Test.

Until quite lately the apex has generally been regarded as the most frequent site of the primary focus of pulmonary tuberculosis. Recently, however, many authorities have adopted the view that the hilus, and not the apex is primarily attacked. Especially does this appear to be the case in children.

Site of
Disease.

I have already stated that the intra-thoracic glands, particularly those at the root of the lung, are most prone to become the seat of tuberculous infection. Sir Douglas Powell writing in regard to the origin of pulmonary tuberculosis, calls them "the dustbins /

Recent
Medical
Opinions.

dustbins of the broncho-pulmonary tract." Dr. L. G. Cole (Amer. Journ. Med. Sci. July, 1910) believes that "with improved technique and more pathological "radio-graphy it will be established that all tuber-
"culous lesions begin at the root and extend to the
"parenchyma."

According to Dr. Alfred Jordan (Practitioner : Feb. 1912) "chronic pulmonary tuberculosis does
"not generally commence at the apex, but begins at
"the root# and extends to the apex and periphery
"along the branchings of the large bronchial
"tubes."

Dr. Bythell (Proc. Roy. Soc. Med. Vol. VI. No.5 pp. 77-92) makes the definite statement that "in
"children pulmonary tuberculosis invariably starts
"at the root of the lungs." Out of 300 successive cases in children examined clinically and radio-graphically, he had never seen a single case in which the disease had not obviously originated at the hilus of the lung, nor met one in which the sole, or even the primary, lesion had been at the apex.

Possibly /

Possibly these statements are somewhat exaggerated, the evidence obtained by Xrays not being always entirely reliable, and the results obtained having frequently proved to be contradictory. Nor is pathological evidence of much service, because in cases so advanced as to cause death, the lungs are generally infiltrated throughout, and it is impossible to tell where the disease originated. Clinically also, without the assistance of the radiograph, early tuberculosis of the hilus frequently escapes unobserved, and the tubercular infection is detected at other parts of the lung, most probably the apex.

Taking all these facts into consideration, and realizing that the majority of all bodies examined post-mortem, whatever the cause of death, show signs of old-standing disease in this region, the weight of recent evidence seems to be in favour of the view that tuberculosis of the lungs does originate in the vicinity of the root, and from thence spreads by way of the lymphatic network to other parts of the lung.

Difficulties

Hilus the
probable
seat of
primary
infection.

— T R E A T M E N T. —

The treatment of tuberculosis in the school child is of supreme importance, because it is among children more than among persons of any other age that the best results are to be looked for. To no other disease does the adage "prevention is better than cure" apply more aptly.

I propose to deal with the subject under the headings - Prophylactic Treatment and Curative Treatment; and to give details of the procedure adopted in Leith for which I am to a certain extent responsible.

PROPHYLACTIC TREATMENT.

Although, strictly speaking, the province of the School Medical Officer lies solely among children between 5 and 14 years of age, in practice I have found it advisable to make an attempt to deal in some measure with the conditions affecting younger children. It is during infancy that the infection of tubercle is most liable to occur; in infancy, therefore, it should be dealt with, with a view to arresting its development.

Accordingly, whenever a tuberculous child is brought to my notice in the course of my examinations, one of the school nurses immediately visits the home in order to ascertain whether any other, and particularly any younger, member of the family is affected.

An /

Prophylactic
Treatment.

Care of
Infants.

An attempt is made to impress upon the mother the necessity of keeping the house clean and well-ventilated, and of bestowing special care, not only on the tubercular child, but on all the younger members of the family. In the case of infants especially, full directions are given as to feeding, and it is pointed out how disorders of the alimentary tract may lead to inflammation and consequent abrasion of the surface, making tuberculous infection all the more easy and probable. Attention is drawn to the necessity for fresh air both in the bedroom and the living room, and the value of sunlight, - the best disinfectant we have - is strongly insisted upon. Unfortunately not only the climate of this country, but also the arrangement of the dwellings in many of our poorer streets are against the possibility of deriving much benefit from this source.

If a member of the household other than the child attending my clinic is found to be suffering from tuberculosis, he is warned to avoid contact with the rest of the family, and to keep special towels, eating utensils, &c. for his own use. Instruction is also given in the method of disinfecting the sputum. Further, the Medical Officer of Health is notified in accordance with Article 3 (2) Public Health (Pulmonary Tuberculosis) Regulations (Scotland) 1912, and the house /

Infected
Persons.

house is visited by a Health Visitor from the Public Health Department, who further emphasises the instructions of the school nurse.

The children attending the school clinic are very generally accompanied by their parents, especially on a first visit. I thus have an opportunity myself of insisting on the above lessons, and of supplementing them by advice to the mother on the care of her own health. Whenever possible, I advocate the breast feeding of infants, and point out the dangers arising from the substitution of cow's milk.

Advice to Mothers.

The risk of tubercular infection from cow's milk is a subject which is being much ventilated at the present moment, and it may, therefore, not be out of place to devote a few words to it here.

Infection from cow's milk.

The late Professor Koch at the International Congress on Tuberculosis held in London in 1901, declared that tuberculosis of man and cow were different, and that tuberculosis of the cow could not be conveyed to man.

But the Report of the British Royal Commission on Human and Animal Tuberculosis, the German Imperial Report, and communications from many individual workers too numerous to name, who have spent years in investigating the subject, seem to prove beyond a doubt the communicability of the bovine virus from animal /

Report of British Royal Commission.

animal to man. The British Royal Commission maintain that they have demonstrated beyond all question not only that the local manifestations of surgical tuberculosis - enlarged glands, tuberculosis of bones, joints and skin, are caused in many instances by the bovine tubercle bacillus, but that they have actually discovered the bovine bacillus in the sputum of two patients suffering from pulmonary tuberculosis.

An account of the most recent work on this subject has just been published by Dr. A. P. Mitchell, Edinburgh, in his "Report on the Infection of Children with the Bovine Tubercle Bacillus" (Brit. Med. Journal 17th Jan. 1914). Dr. Mitchell asserts that tuberculosis in cervical glands is very common in Edinburgh, and he goes on to give the results of his investigations in 72 consecutive cases of the disease. He found that experiments on the rabbit could be relied upon to differentiate between the bovine and the human bacillus. In this way, of the 72 specimens in his series, obtained by operation on the cervical enlargement, in 69 cases, or 90%, the bovine bacillus was present; the human bacillus in 7 cases, or 10%. He verified his results by a careful consideration of certain clinical data which he personally collected, such as age, family history, geographical relations, and /

Report of Dr.
A.P.Mitchell,
Edinburgh.

and the milk supply. 84% of the children of 2 years of age and under had been fed with unsterilized cow's milk from birth. In only three instances was there a history of pulmonary tuberculosis, and in each the patient had been living for years in contact with a "consumptive" when the glands appeared. In these three the human type of bacillus was isolated from the cervical gland.

He concludes that cow's milk containing tubercle bacilli is clearly the cause of 90% of the cases of tuberculous cervical glands occurring in infancy and childhood in the Edinburgh district. He further contends that the prevalence of tuberculous cervical glands is due to the circumstance that about two-thirds of the Edinburgh daily milk supply comes from small byres situated in rural areas around the city, where there is practically no supervision, and he states that 50% of the children of his series who were harbouring the bovine bacillus had been born and brought up in these districts. He is of the opinion that tuberculosis in dairy cows in Scotland is extremely prevalent, and this fact, taken in conjunction with the other, that it is almost the universal practice in Scotland to feed children with unsterilized cow's milk, he regards as mainly accountable for the /

90% of cases
due to infec-
tion from cow's
milk.

Edinburgh
milk supply.

the prevalence of tubercle in young children.

Deliberate experiment from animal to man cannot, of course, be contemplated in order to obtain proof positive that the transmission of the bovine bacillus can take place, but where there is such a considerable consensus of opinion on the point, surely the evidence may be regarded as sufficient.

There is urgent necessity, therefore, for the more careful supervision of byres in country districts, and Local Authorities should have the power to seize tuberculous cows supplying milk for human consumption, in addition to the power they already hold of seizing and destroying tuberculous cattle exposed for sale as human food.

More careful supervision of byres necessary.

In the meantime, the sterilization of milk at 140°F. for 20 minutes should be universally advocated, at any rate in this country. In opposition to this view, I may cite Mr. Edmund Owen (Lancet : 10 Jan. 1914) who gives it as his opinion that sterilized milk is quite unsuitable as a food for infants, that it has lost its "living spirit", and gives rise /

Value of Sterilization.

rise to Rickets and Scurvy. Nor is he alone in this respect.

At the same time, it must be remembered that in France and Germany where the method is most popular, hundreds of thousands of children have been reared on sterilized cow's milk without its having been shown to result in the production of either of these diseases.

The question of the transmission of the bovine bacillus is one which affects different countries in different degrees. In the British Isles, and as it would seem, more especially in the Edinburgh district, the subject appears to be of great importance.

Geographical
anomalies.

In China, on the other hand, it need hardly be taken into consideration, since although tuberculosis is prevalent, milk is seldom used as an article of diet.

In Japan, and also in Greenland, the mortality from tuberculosis is the same in children as in adults, and yet in the former country there is no tuberculosis among cattle, and in the latter there are no cattle!

Since writing the above, the President of the Local Government Board was asked in the House of Commons (26th March, 1914) by Mr. Astor whether his attention had been drawn to the investigations conducted by Dr. Mitchell and Mr. Stiles in regard to the causation of tuberculous cervical glands in infants and children residing in Edinburgh; whether 90% of the cases examined had been traced to cow's milk containing bovine tubercle bacilli; and whether he proposed to take any steps for the better protection of children from the infection of tuberculosis conveyed by milk?

The President of the Local Government Board replied that he was aware of the investigations referred to, and that similar investigations had been made on behalf of the Local Government Board, which indicate that tuberculosis in children is often clearly connected with the consumption of tuberculous milk. He also stated that he was engaged in the preparation of legislation to deal with this and other sources of infection and with the adulteration of milk, and hoped to be able to make a statement with regard to it at an early date.

— SCHOOL HYGIENE. —

Long before medical inspection and treatment were dreamt of, the hygienic condition of schools had come to be a matter of grave consideration among all educational authorities. As modern and more enlightened ideas on the subject of personal and domestic hygiene became general, it was recognised that the national schools too, must undergo reform, if the educational ideal mens sana in corpore sano were to be in some measure realized. Thus, at the present day, the most stringent regulations are laid down by the Educational Department in every thing that pertains to school buildings. The size of classrooms, the number of pupils in each, the cubic space per pupil, ventilation, heating, lighting, lavatory and playground accommodation are all strictly regulated. The walls and floors are constructed so as to harbour as little dust as possible, and great attention is paid to the systematic cleaning and disinfecting of the classrooms. The number of pupils in each classroom is restricted to fifty, and it is expected that the number will shortly be reduced to forty. The minimum space allowed per pupil is 10 square feet, and long forms and desks are being superseded by dual /

School
Hygiene.

School
Buildings.

Restriction
of size
of
Classrooms.

dual and individual desks, so as to prevent overcrowding and the additional risk it implies of spreading infectious disease. In this connection, it is to be remembered that it is only of recent years that tuberculosis has come to be so regarded.

Compared with the schools of forty years ago, the up-to-date Board School is a species of Sanatorium, or might be if those in charge were sufficiently enlightened to use the means at their disposal to the best advantage on behalf of the pupils. It is among the duties of the School Medical Officer to point out how this may be accomplished, and opportunities are also afforded him of conferring with the architect and sanitary engineers, with a view to making suggestions when a new school is in contemplation. The value of all this in the prophylactic treatment of tuberculosis goes without saying, and is not to be overlooked in any detailed consideration of the subject.

The cleansing and disinfecting of schools as practised to-day is another active measure which should tend to minimise disease, including, of course, tuberculosis.

The School Medical Officer and school planning.

Cleansing and disinfecting of Schools.

A memorandum on the subject was issued by the Scotch Education Department and the Local Government Board for Scotland in 1908. The directions are very minute and exact, and represent the minimum precautions to be observed.

In Leith these directions are carefully adhered to and spraying of the classrooms with a suitable disinfectant is regularly carried out at frequent intervals, the intervals being lessened in the event of an epidemic of any of the infectious diseases.

All the schools are under the general supervision of the Public Health Authorities, but I myself regularly inspect the sanitary conditions, and report to the Board any defect.

— MEDICAL INSPECTION of SCHOOLS. —

The medical inspection of schools and school children came into force on the passing of the Education (Scotland) Act 1908, and medical treatment was only inaugurated as recently as 1913. Most school Boards lost no time in taking advantage of the powers conferred upon them, and immediately set about appointing medical officers and nurses for the carrying out of /

Medical
Inspection.



of the work. I doubt if many of the members fully realise the extent to which not only the children, but the Boards themselves, in their official capacity, benefit from the efforts of the medical staff. It is a matter of comment, especially in the large towns, that the average attendance has greatly improved during the last three years. In Leith last year, i.e. since the introduction of treatment, the attendance was the highest on record. This, of course, means a gain in government grants, since it is on the average attendance that these are paid, and a consequent saving to the ratepayers, with whom the Board have always more immediately to reckon.

Improved
school.
attendance.

That the improvement is largely due to medical inspection cannot be gainsaid. Malnutritional conditions and minor ailments such as decayed teeth, enlarged tonsils, otorrhoea, conjunctivitis, and neglected sores are not only immediately detected, but are treated at the school clinic with the most satisfactory results. Many teachers have been quick to realise the benefit, and show a praiseworthy anxiety to bring to my notice any cases requiring medical attention.

School
Clinic.

In the building devoted to the purposes of medical inspection in Leith, fully equipped rooms have been fitted up for the treatment of eyes and teeth.

Specialists have been appointed to take charge of these departments, and an Aurist is also shortly to be /

Appointment
of
Specialists

be appointed.

As showing the amount of work completed between 4th March and 31st July last year, the following table is of interest :-

CLINIC CASES : (Dressings, &c.)

Table.

Children in attendance - - 319

Total number of attendances made 3,028

DENTAL DEPARTMENT :

Children in attendance - - 318

Extractions - - - 1,099

Fillings - - - 115

Total number of attendances made - 547

EYE DEPARTMENT :

Children examined for errors of
refraction - - - 107.

In the course of medical inspection, one of our most obvious duties is to emphasise alike to children, parents, and teachers, the necessity of personal cleanliness, and immediate attention to all ailments and defects however small. It does not seem to be generally appreciated to what extent many avoidable complaints are due in the first instance simply to dirt. Dirt in the teeth produces decay: dirt in the head encourages vermin. Abscesses and sores are the result, and there you have the beginning of a vicious chain, of which the final link may be tuberculosis.

Personal
Cleanliness.

The /

The medical staff in any town being limited, it is largely to the teachers that we must look to second our efforts in detecting and eliminating at the beginning "the unclean thing". Every teacher is brought into close and daily contact with his or her little group of children. Their opportunities of observation are of the fullest, and their influence on the children is incalculable. Nothing could be more striking than the difference in the standard of cleanliness that may prevail among the various classes in the same school, a difference which I have no hesitation in saying is mainly attributable to the degree of interest manifested in the subject by the teacher. "To teach the child, teach the teacher" has accordingly become a thoroughly appreciated axiom; and in all the training centres a whole time medical lecturer on personal and school hygiene has been appointed. All students are required to take a course of physical training under medical direction, and direct observational study is substituted for generalised lecturing. Every student is brought face to face with groups of children, and is made to examine them and record his observations in writing. Attention is drawn to any departure from the normal in eyes, ears, throat, teeth, glands, bones, joints, skin, hair, general nutrition, colour, gait, posture, &c., and the student is thus taught to distinguish between appearances in health and /

Influence
of
Teachers.

and in disease.

The advantage of this training in observation cannot but be manifest when the student becomes a teacher. He will inevitably have a higher conception of what is meant by personal and school hygiene, and will be less tolerant than he frequently is at present of failure in these respects.

— OPEN-AIR TREATMENT. —

In the organised campaigns against tuberculosis now being waged in every civilized country, two facts stand out pre-eminently. Firstly, the advantage of early diagnosis, and secondly, the necessity for open-air treatment.

America, Germany, and Scandinavia may be taken as the ^{the} pioneers of open-air movement, and Great Britain is realising that if progress is to be made, many useful lessons are to be learned from the experience and the experiments of these countries.

That we are fully alive to the value of their example is manifest from the organised efforts now being made to deal with the disease in systematic fashion, and on similar lines. Since the coming into force of the National Health Insurance Act, the movement has received a fresh stimulus. The Interim Report of the Departmental Committee on Tuberculosis in connection with this measure was presented in 1912, and recommended the establishment of machinery for the treatment /

Sanatoria
and
Open-Air
Schools.

Report of
Departmental
Committee, 1912.

treatment of tuberculosis by means of two units, namely, (a) The Dispensary unit, consisting of dispensaries with their staff of Specialists, &c, (b) The Institutional unit, consisting of Sanatoria, Hospitals, &c.

In accordance with the latter recommendation, Sanatoria are now being erected throughout the country, and in some of them, at least, provision is being made for the treatment of children.

But where children are concerned, the open-air school is unquestionably what is required, particularly for the treatment of the pre-tubercular child. The movement has passed beyond the experimental stage, and both at home and abroad the results conclusively prove the undoubted benefits to be derived from open-air education.

The idea is not a new one; it was practised by the Greeks and Romans. But the originators of the methods of to-day were the Educational Authorities at Charlottenburg, near Berlin, where a very large and splendidly equipped institution was opened in 1904.

In 1907, the London County Council followed suit, and now have seven schools of the kind under their control. Other parts of the country have not been behindhand, until in 1913, in addition to numerous day day schools, there were seven open-air residential schools established throughout Great Britain.

First open-air
school in
Britain
opened
1907.

The /

The type of child who best responds to open-air treatment belongs to the debilitated, anaemic, and ill-nourished class, the child, that is to say, who is most likely to fall a victim to tuberculosis. Great benefit is also derived by children suffering from adenoids, rickets, spinal curvature, &c. Sir George Newman in his Annual Report to the Board of Education, 1912, gives it as his opinion that 10% of the school population of the country are in need of some such treatment. He also states that "the success of the "open-air school depends upon (a) the proper selection "and classification of the children to be admitted; "(b) adequate organisation and a suitable staff; (c) " sufficient and appropriate equipment; (d) constant "medical supervision; and (e) the co-operation of the "parents of the child".

There is no need here to enlarge upon the advantages to be derived from such a school. Fresh air, good food, bathing, lightened curriculum, regular intervals of rest, and a certain freedom of action - these all tend to stimulate growth and nutrition, and enhance the child's powers of resistance to the germs of disease.

To quote again from Sir George Newman's Report - "The improvement - mental and physical - has been so "marked that particular tests and measurements seem "hardly necessary. For comparative purposes, however, "they /

Type of child
who derives
most benefit.

Sir George
Newman's
Report,
1912.

Advantages of
open-air schools

Comparative
tests.

"they have their value. Generally speaking, they are
 "7 in number :-

- "1. Height and weight.
- "2. Chest expansion.
- "3. Tests of muscular power.
- "4. Indications of increased metabolism, and
 "improved nutrition, carriage, colour of
 "mucous membrane, proportion of haemo-
 "globin in the blood.
- "5. Mental tests, motor and sensory reactions ...
- "6. Improved health, or in other terms, disease
 "cured.
- "7. Improved subsequent attendance at the
 "ordinary school."

In 1912, at Bradford, where the average duration
 of attendance was a little more than 5 months, the
 average gain in weight was $4\frac{1}{2}$ lbs; there was an
 increase of 21.5% in haemoglobin; and the chest
 measurement showed an average increase of 1.12 inches.

Bradford.

At the Preventorium, New Jersey, an open-air
 school for children of 4 to 14 years, during an average
 stay of about 3 months the average gain in weight was
 7 lbs. There were some phenomenal gains, a few of
 25 lbs.

New Jersey.

Further proof of the advantages of such schools
 is superfluous, and where an educational body cannot
 afford to erect a school of this description, it
 should, at any rate, provide as good a substitute as
 possible in the form of open-air classrooms.

I have dealt at some length with this part of my subject because, of all the measures that have been proposed for dealing with tuberculosis, I am convinced that up to the present the open-air school is by far the most promising. Doubts are in some quarters expressed as to the value of the Tuberculin treatment, but practically all authorities are agreed that fresh air, superalimentation, gentle exercise, abundant rest, and absence of strain, either physical or mental, are the most important factors alike in the cure and the prevention of tuberculosis. These both child and adult may enjoy in the Sanatorium, and in the records of these institutions there are abundant instances of so-called cures. But what of the after history? Generally speaking, among the working classes, when the working man or woman returns to the unfavourable conditions of their ordinary life, there is a recrudescence of the disease, and in two years at the outside, the so-called "cure" succumbs.

Better and more lasting results are to be met with in the case of the working man's children even as it is, but if the Sanatorium could be immediately followed up by the open-air school - if the "delicate" child, whether or not he had been positively diagnosed as tuberculous, could pass the whole or the greater part /

More open-air
schools
essential.

part of his school career under the continuous influence of the open-air principle, does not experience tend to prove that he would develop into a normally healthy adult?

If then the State, in addition to and largely instead of subsidizing the building of Sanatoria, in the strict sense of the word, would proceed with or support the erection of open-air schools, both day and residential, if encouragement were given to building ordinary day schools more on open-air lines, a more effectual move would have been made than any that has yet been suggested in the great Anti-tuberculosis Campaign. It is a measure in which the State must intervene. The matter is too big for Municipalities and School Boards to tackle individually, especially when it is borne in mind that the towns in which tuberculosis is most rampant are precisely those in which the population is largely working-class, where the housing conditions therefore are probably worst, and the rateable value of property lowest.

A generation largely educated in schools of the kind specified, educated not only in the three Rs, but in the appreciation of a clean body, clean air, and "a place in the sun", as the greatest gifts of God, would be a better asset to the nation than any number of "cured" individuals, however greatly these might redound to the credit of medical science.

Necessity
for
State
Assistance.

— CURATIVE TREATMENT. —

The curative treatment of tuberculosis does not enter to any marked extent into the duties of a School Medical Officer. When curative treatment becomes imperative, his function is to supervise rather than to treat. The most he can do is to advise and, if necessary, urge the parent to seek special surgical or medical advice, and when this has been obtained, to watch the progress of the case in the convalescing stages.

Curative Treatment.

GLANDS.

As already described, all children with enlarged cervical glands are kept constantly under observation at my office, and if, after all other possible causes have been eliminated, the gland persists and even increases in size, the case is recommended to one or other of the local hospitals. After the operation, the children have their wounds dressed at first at the hospital, and later at the school clinic.

Cervical Glands.

In the majority of instances, the parents are very willing to acquiesce in whatever course I may recommend, and the removal of the offending gland is usually followed by exceedingly good results. Unfortunately, every now and again, one comes across a parent of the ignorant, termagant type, who refuses to have her child "hashed and disfigured", and we have no means but those of moral suasion to bring to bear in the /

the interest of the child. I have in my mind at the present moment a typical illustration.

Mary McC., a girl of 10 years, was first seen by me a year ago, and had a suspicious swelling at the angle of the right lower jaw. Again and again I strongly urged the parent to take the child to the hospital, but this she absolutely refused. Five weeks later, the neighbouring glands had become infected, and the mother could no longer deny that it was time to do something. The child was accordingly admitted to the Royal Hospital for Sick Children, Edinburgh, where it was found that the disease had spread to the inferior maxilla. Altogether, five different operations were necessary, and the child is, of necessity, badly scarred. She is also extremely anaemic, and has, in the meantime, been sent to a Holiday Home.

What I have said above as regards the treatment of cervical glands, applies also in the case of abdominal glands. All the School Medical Officer can do is to make a definite diagnosis after deliberate observation, and, when satisfied of his facts, to recommend that treatment be obtained in the proper quarter. A certificate of prolonged absence from school is granted, continuous supervision is maintained, and during convalescence a few weeks residence at a Holiday Home is arranged for when possible. In all /

Mesenteric
Glands.

all cases where treatment is obtained at a Hospital, I visit the patient from time to time, and when the treatment is carried out at home, the school nurses keep in touch with the case and report progress. When the child returns to school, the teacher is made aware of the tubercular history, and keeps a watchful eye upon him, and, as far as may be, is lenient in the matter of lessons.

— BONES and JOINTS. —

All acute cases of tuberculous disease of bones and joints are dealt with either at home or in Hospital. This is the stage when the disease is commencing and progressing; when rest in the recumbent position, immobility of the part attacked, and the adoption of special means to correct or prevent deformity and abolish muscular spasm, are essential.

Bones
and
Joints.

Acute Stage.

Both the acute and the subacute stage usually prevent the child from receiving close personal observation from the School Medical Officer. In the latter, recumbency is not, as a rule, necessary, but complete immobilization of the part attacked must be maintained, both to allow repair to take place, and to prevent the occurrence or increase of deformity.

Chronic
or
Subacute
Stage.

The /

The stage of convalescence comes more closely under our supervision. Complete immobility is not essential, protection or support by means of light, accurately fitting splints being usually sufficient.

Should the parents of the patient not be in a position to obtain the splints that are necessary, these are supplied, in our case, either by the Cripple Aid Society in Edinburgh, or by local instrument makers, the cost being defrayed by the School Board. Repairs or alterations to splints as the child grows are similarly attended to, and, in some instances, a special chair or foot rest is supplied to the school when the child is fit to resume attendance.

— PULMONARY TUBERCULOSIS. —

The curative treatment of Pulmonary Tuberculosis in Leith is mainly conducted at the Tuberculosis Dispensary, and the Sanatorium of the Leith Public Health Hospital.

The procedure is as follows :-

METHOD /

Stage
of
Convalescence.

Pulmonary
Tuberculosis.

METHOD of PROCEDURE in LEITH.

The method of dealing with pulmonary tuberculosis among school children in Leith may briefly be described as follows :-

Children who after examination and, if necessary, prolonged observation, have been diagnosed by myself as suffering from tuberculosis, are passed on in the first place to the Leith Tuberculosis Dispensary. Through the efforts of the Medical Officer of Health for the town, this institution was inaugurated some months prior to the coming into operation of the National Health Insurance Act, and has without doubt proved a great acquisition from a public health point of view. It is available to patients of all ages 4 days in the week.

Public Health
Dispensary.

At the Dispensary the child is subjected to a clinical examination by the Physician in charge, and in addition, the cutaneous tuberculin test of von Pirquet (see p. 20) is applied. In 95% of the cases sent by myself a positive reaction was obtained. For the /

Application
of
Tuberculin
Test.

the year ended December 31, 1913, 223 school children gave a positive reaction. This number includes contacts sent in by Health Visitors, &c.

When a positive reaction is obtained, the prescribed treatment is commenced forthwith. In the first place a Lady Health Visitor visits the home and obtains information on such points as the occupation of parents, approximate income, house rental, length of tenancy, number of inmates, number and description of apartments, conditions relating to presence or absence of damp, exposure, whether back to back or through ventilation, hygienic standard, general dietary, family record of health, and possible sources of infection. At the same time she takes the opportunity of imparting to the Mother many valuable hints on the hygiene of the home, and gives special advice as regards the care of the affected child.

If other debilitated children are met with in the same family, the parent is advised to bring them to the Dispensary for examination.

As /

Subsequent
Treatment.

Home
Visitation.

Contacts.

As regards the patient himself, a card is allotted to him giving particulars as to age, weight, site of disease, treatment to be adopted, &c., and his progress is entered up at every visit.

Record
of
Patient.

The parent is given a thermometer and is instructed in its use, and must keep a daily morning and evening record. In the majority of cases the children are given an emulsion.

Daily
Temperature
Chart.

At the end of the first week, if the temperature has remained normal, the treatment proper is commenced. An initial dose of .00001 c.c. of P.T.O. is injected, and afterwards the child presents himself for injections twice a week. During the whole course, the temperature is registered daily. If there is no ^{gradually} action, and no rise of temperature, the dose is/ increased up to .05 c.c. The patient then comes only once a week, and the dose is still further increased until 1 c.c. is received without unfavourable results. Should the temperature rise, or a sharp reaction result, the interval between the injections is increased, and the dose remains stationary.

Treatment
by
Injection.

Where /

Where the temperature chart shows frequent rises, the child, if possible, is admitted to the Hospital, for more constant observation. The necessity for this is obvious. Many parents, though very willing, cannot be entrusted even to use a thermometer with any accuracy, and a child in Hospital may show no febrile symptoms during the whole of his stay, though previously a "temperature" had daily been recorded on the chart kept by the Mother.

Whenever it is obtainable, the sputum is examined bacteriologically, and it is worthy of note that during the last year, from 5 to 7% of specimens giving a negative result to the Ziehl-Nielsen test were positive when the Antiformin method was applied.

The duration of treatment usually occupies from 8 to 10 months. After the course is completed, the child is requested to report himself at stated intervals so that the physicians in charge may satisfy themselves that there is no recurrence. Every week, almost 100 attendances are made by school children, and an average of 6 new cases are seen.

Examination
of
Sputum.

Duration
of
Treatment.

Average
weekly
attendance.

Ever /

Ever since the commencement of School Medical Inspection in Leith, in May, 1910, a close co-operation has existed with the Public Health Department. Thanks to this, I am able to keep in touch with every case I send to the Dispensary, and the fullest facilities are afforded me of following up those in which I am specially interested. A full weekly report is forwarded to me regarding the progress of each case - whether the child has reacted positively or negatively to the tuberculin test; whether a course of tuberculin treatment is recommended; or whether the child should be admitted to the Public Health Hospital. Doubtful cases I discuss with the Physician in charge, and decide along with him whether complete absence from school is necessary, or any other measures likely to prove of advantage to the child's general health. I am also informed of the days on which each child is due at the Dispensary, and am thus able to take measures to ensure his regular attendance.

It is the same with all cases admitted to the Public Health Hospital at Pilton. The Hospital is finely situated in spacious grounds over-looking the Firth of Forth, and there is now Sanatorium accommodation for 54 patients. Of these the average number of children is usually 20. Originally simple shelters were /

Relation to
School
Medical
Department.

Sanatorium
Treatment.

were utilized for the accommodation of the patients, but now a bungalow has been erected, and this, together with an empty ward, furnishes the required space.

In addition to the prescribed treatment by tuberculin, as received by patients attending the Dispensary, every possible means is adopted to effect an improvement in health. Continuous and abundant fresh air is the order of the day and night. The windows are always open, and patients, when they are well enough, are in the grounds all day.

Open air.

Abundance of good, wholesome food is supplied, and it is part of the education of the inmates to make them acquainted with the comparative value of food-stuffs. Many of the articles of diet used are practically unknown to them, not on account of their rarity, but because national custom has, until recently, excluded them from the monotonous and unsatisfactory dietary of the poor. The body-building qualities of such cereals as oatmeal, rice, beans, peas, and lentils are explained to them, and though usually they are not at first appreciated, the palate gradually becomes accustomed to them. 'Popular' food such as beef and potatoes is not encouraged, though not entirely absent from the menu. Tea is allowed only once a day, cocoa made with milk being given as a substitute.

Food and value
of
food-stuffs.

A child suffering from tuberculosis is usually admitted to the Sanatorium from 10 to 12 weeks, and during that period invariably improves, the fresh air, good food, regular hours, and plenty of rest, together with the medicinal and tuberculin treatment, in most cases working wonders.

After a child is discharged, he reports himself at regular intervals at the Dispensary, and also at my office, in order that a further watch may be kept on his progress.

From the foregoing it will be seen that Leith takes a leading part in the administrative control of tuberculosis in children, and if the present methods are continued and elaborated, there is every reason to look hopefully towards the future.

* The Medical Department of the School Board acts in a manner as a sorting-house, and the Dispensary as a link between it and the Sanatorium, each having a side link connected with the homes. The tuberculous child has thus every chance afforded him of benefiting by what is at present regarded as the most favourable method of treatment, and the response he makes is most encouraging. What is discouraging is to see how rapidly in many instances the benefit disappears when he returns to his more or less squalid /

squalid home surroundings.

Treatment at the Sanatorium should be followed up by a course at an open-air school, where open air treatment and suitable feeding could be continued, not merely until the child's health is thoroughly re-established, but until something had been achieved towards building up a stable constitution. Difficulties have been put in the way of utilizing an excellent site which the Leith School Board acquired some time ago for the purposes of an open-air school. There is good reason to believe that these are now about to be overcome, and when the school is built, the scheme for the treatment of tuberculous children will be complete, as far as the responsibility of the School Board is concerned.

It will then lie with the Municipality to secure better housing accommodation for the working classes, and to arrange for more strict supervision of the milk supply, of dwelling-houses and of the streets which, to such a large extent, are the playground of the children.

I append /

Benefit of an
Open-air School

I append a table giving particulars of 40 cases of pulmonary tuberculosis, which I specially followed up. It is of interest as illustrating the main points on which I have laid stress in dealing with this section of my subject.

Table.

The cases were chosen at random from the numbers I had sent on from the School Clinic to the Dispensary, and were not selected on account of any unusual circumstances. All of them received sanatorium treatment at the Public Health Hospital, and during their stay the improvement, as shown by gain in weight, was very marked. The loss was equally marked in the case of children, who after leaving the Sanatorium had to return to insanitary or overcrowded homes. On the other hand, the child whose home was fairly clean and well-situated, and whose parents followed out intelligently the medical instructions given, usually managed to hold its own, and even in exceptional cases to progress, as shown by continued increase in weight and regular attendance at school.

The average stay in the Sanatorium was seventy-two days. The average gain in weight was 6.6 lbs. This is on all fours with the results obtained in open-air schools (see page 58). In thirty out of the forty cases there was a family history of consumption.

Particulars of 40 Cases who Received Sanatorium Treatment

No.	Name	Age	No in Household.		No.	Apartments Condition.	Ventilation	Hygienic Standard	Days in Sanatorium	Gain in Weight in Sanatorium	Weight since Discharge.	Family Record of Phthisis	Probable Source of Infection and Contributing Factors.	Duration of Treatment	Subsequent Attendance at School.
		Yrs.	Adults	Children											
1.	J. W.	12	4	4	3	Dirty.	Back to back.	Low.	7 3/4	6 1/2	Loss	Mother	Exposed to infection: Unhealthy home.	18 mos.	Fairly regular.
2.	M. K.	14	5	4	2	Dirty.	Through: windows closed.	Low.	8 3/4	10	Stationary	Paternal Uncle	Over-crowded & unhealthy home	13 "	Irregular.
3.	M. M.	12	6	3	2	Fairly clean.	Through: windows closed.	Low.	9 6	5	Loss	None.	Shared bed in kitchen	12 "	Fairly regular.
4.	M. M.	8	2	5	2	Fairly clean.	Through: windows open.	Very high	100	6	Gain	None	No evidence	7 "	Regular.
5.	M. P.	12	6	2	3	Clean.	Through: windows open.	Fairly high	7 6	7	Gain	None.	Sister consumptive	18 "	Regular.
6.	K. M.	8	4	3	2	Dirty.	Through: windows closed.	Very low.	80	8 3/4	Loss	Father	Exposed to infection: Overcrowded (eng)	9 "	Irregular.
7.	J. L.	12	6	2	3	Dirty.	Through: windows closed.	Very low.	80	8	Stationary	Maternal aunt	Shared bed in kitchen Dirty: Damp.	12 "	Irregular.
8.	A. H.	12	5	1	3	Fairly clean.	Back to back	Low.	5 2	7 3/4	Stationary	Mother	Sister consumptive	16 "	Regular.
9.	M. H.	9	5	1	3	Fairly clean.	Back to back	Low.	5 2	5	Stationary	Mother.	Brother consumptive	16 "	Regular.
10.	N. M.	8	5	3	2	Clean	Back to back	High	39	7 3/4	Loss	Mother, 6 blind, and 5 other children.	Very bad family history: Constant exposure to infection.	9 "	Irregular.
11.	E. S.	12	6	1	3	Fairly clean.	Through.	Fairly high	65	9	Stationary	None	Shared bed - closet	9 "	Regular.
12.	R. D.	13	5	2	2	Dirty.	Through: windows closed.	Fairly low.	80.	9 3/4	Loss.	None.	Brother consumptive: house damp.	9 "	Irregular.
13.	M. M.	6	2	3	1	Clean.	Back to back	Very high	3 2.	2 1/2	Stationary	None.	Sister consumptive	10 "	Fairly regular.
14.	J. C.	9	2	3	1	Fairly clean.	Back to back.	Low.	66	10.	Loss.	Grandmother.	Sister consumptive: Shared bed in kitchen.	21 "	Irregular.
15.	J. S.	10	6	1	3	Dirty.	Back to back.	Very low.	60	7 1/4	Loss.	Mother.	Brother consumptive: Unhealthy home.	6 "	Irregular.
16.	A. T.	10	3	2	3	Very clean.	Through: windows open.	Very high	40	14 1/4	Gain	Maternal aunt.	Consumptive cousin in house.	8 "	Regular.
17.	C. W.	12	4	2	1	Very clean.	Back to back	Fairly high	5 1/2	10	Gain.	Father.	Consumptive sister: Shared bed in kitchen.	9 "	Fairly regular.
18.	N. B.	10	5	3	2	Dirty.	Back to back	Fairly low.	8 2.	5	Loss.	None.	Unhealthy home.	6 "	Fairly regular.
19.	L. M.	10	5	0	3	Fairly clean.	Through: windows open.	High	99	9 1/4	Loss	Mother died of consumption	Chair's bed in kitchen	9 "	Fairly regular.
20.	J. S.	6	7	2	4	Fairly clean.	Through: windows closed.	Fairly high	6 1/4	5 3/4	Loss.	Grandmother & Maternal aunt.	Shared bed in kitchen	9 "	Irregular.

Particulars of 40 Cases who Received Sanatorium Treatment.

No.	Name	No. in Household	No. Adults	No. Children	Apartment No.	Condition	Ventilation	Hygienic Standard	Days in Sanatorium	Gain in Weight Sanatorium	Weight since Discharge	Family Record of Phthisis	Probable Source of Infection and Contributing Factors	Duration of Treatment	Subsequent Attendance School
21	K. M. D.	11	7	3	3	Very clean.	Through: windows open.	High	56	5 lbs	Gain	Elder Sister	Sister Consumptive	8 mos.	Regular.
22	J. C.	6	3	3	1	Fairly clean.	Back to back	Fairly high	72.	7.	Loss.	—	Shared bed in Kitchen	9 "	Irregular.
23	T. H.	8	2	2	1	Fairly clean.	Back to back	Low.	141.	13 1/4"	Gain	Mother and Maternal Uncle.	Brother consumptive	15 "	Granted six months absence from school.
24	J. D.	10	5	7	3	Clean.	Back to back	Fairly high	125	7 3/4"	Stationary	—	Eight out of ten children diminutive and rickety: four have phthisis.	12 "	Regular.
25	M. C.	12	2	2	2	Very clean.	Through: windows open.	Very high	77	3 1/2"	Gain	—	Brother consumptive	12 "	Regular.
26	J. M.	7	8	1	1	Very clean.	Through: windows open.	Fairly high	51	3 1/2"	Gain	—	Sister consumptive	8 "	Granted six months absence from school.
27	J. M. C.	10	3	5	2	Fairly clean.	Back to back.	Fairly high	75.	2 3/4"	Stationary	Mother	Brother consumptive	18 "	Regular.
28	T. H.	6	2	2	2	Fairly clean.	Back to back.	Fairly high	67.	4 1/2"	Gain	Mother & Maternal Uncle.	Shared bed in Kitchen: Brother consumptive.	10 "	Granted six months absence from school.
29	J. M. D.	13	3	5	2	Fairly clean.	Back to back.	Fairly high	132.	9 1/4"	Gain.	—	No evidence.	20 "	Regular.
30	M. D.	7	1	2	2	Dirty	Through: windows closed.	Low.	59.	6 1/4"	Loss.	—	Unhealthy home.	15 "	Irregular.
31	A. D.	10	6	5	1	Clean.	Through: windows open.	High.	33.	8 1/4"	Stationary	Father died of Phthisis.	Sister consumptive	6 "	Regular.
32	J. W.	7	5	1	2	Dirty	Back to back.	Low.	146	3 1/4"	Loss.	—	Unhealthy home. Sleeps in kitchen.	9 "	Irregular.
33	A. S.	11	3	3	2	Clean.	Back to back	High	36	8 1/2"	Gain	Mother.	Mother consumptive	16 "	Regular.
34	E. W.	11	3	2	2	Dirty	Back to back	Very low.	36.	3 "	Loss.	—	Shared bed in Kitchen: Sister died of Consumption.	16 "	Irregular.
35	L. C.	9.	1	1	2	Very dirty	Back to back	Very low.	170	6 "	Stationary	—	Unhealthy home.	15 "	Regular.
36	M. M. D.	12	1	0	3	Clean.	Through: windows open.	High.	125.	7 1/4"	Gain	—	Bed. chair in kitchen	18 "	Regular.
37	W. D.	11	3	6	2	Clean.	Through: windows open.	High	93.	11 "	Gain	Maternal aunt and uncle.	Sister consumptive	12 "	Regular.
38	J. J.	9	6	5	2	Fairly clean.	Back to back.	Fairly high	89.	9 "	Gain.	Father.	Shared bed in Kitchen: Brother consumptive	3 "	Regular.
39	S. L.	10	3	1	2	Dirty.	Back to back.	Low.	80	8	Stationary	Maternal Aunt.	Unhealthy home.	20.	Irregular.
40	L. D.	10	3	6	2	Clean	Through: windows open.	High	51.	2	Stationary	Maternal aunt and uncle.	Brother consumptive.	9 "	Regular.

SUMMARY :-

The points which I have endeavoured to emphasize in the foregoing Thesis are the following :-

1. Tuberculosis among school children is more common than is usually suspected.
2. While the influence of heredity is not to be discounted, infection mostly occurs in infancy, either from contact with infected persons or as a result of feeding on tuberculous milk.
3. More general supervision of infants by Health Visitors is therefore desirable, and legislation is required with a view of obtaining a pure milk supply.
4. School Medical Inspection plays an important part in any organised scheme for dealing with the whole question of tuberculosis. It affords a means of detecting cases among children, and by the diagnosis and treatment of minor ailments and low/^{health} conditions, it tends to raise the general physical standard of the child.
5. School Medical Inspection also fills the gap between the supervision of infants in their homes, and the supervision of tuberculous adults by private medical practitioners or in /

SUMMARY continued.

in Sanatoria.

6. The comparatively low percentage of tuberculosis found in school medical reports is to be attributed to the fact that the School Medical Officer is compelled to rely solely on clinical diagnosis; the Tuberculin test only coming into force when the child passes into the hands of the Public Health Authorities.

7. The work of the School Medical Officer is almost exclusively concerned with the forms of tuberculosis as it occurs in glands, bones and joints, and lungs.

8. From his point of view the most important preventive measures resolve themselves into the solution of the housing problem, and the question of the provision of a supply of pure milk.

9. The most important measure, at once preventive and curative, is to be found in the provision of open-air schools.

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